

WHAT IS CLAIMED IS:

1. A transparent substrate bearing a temperable high shading performance low-emissivity coating comprising, in sequence outwardly:

- 5 (a) a first infrared-reflective film;
- (b) a first high absorption blocker layer deposited directly over the first infrared-reflective film, the first high absorption blocker layer comprising niobium;
- (c) a middle coat comprising a transparent dielectric nitride film deposited directly over the first high absorption blocker layer;
- 10      (d) a second infrared-reflective film;
- (e) a second high absorption blocker layer deposited directly over the second infrared-reflective film, the second high absorption blocker layer comprising niobium; and
- 15      (f) an outer coat comprising a transparent dielectric nitride film deposited directly over the second high absorption blocker layer;

wherein the first and second high absorption blocker layers have a combined thickness of greater than 50 angstroms.

2. The transparent substrate of claim 1 wherein the first and second high absorption blocker layers have a combined thickness of less than about 80Å.

3. The transparent substrate of claim 2 wherein the first and second infrared-reflective films have a combined thickness of between about 150Å and about 260Å.

4. The transparent substrate of claim 1 wherein the transparent dielectric nitride film

directly over the first high absorption blocker layer comprises silicon nitride.

5. The transparent substrate of claim 4 wherein the silicon nitride has a thickness of less than about 300Å.

6. The transparent substrate of claim 1 wherein the middle coat begins with the  
5 transparent dielectric nitride film directly over the first high absorption blocker layer and ends with a transparent dielectric oxide film directly beneath the second infrared-reflective layer.

7. The transparent substrate of claim 6 wherein the middle coat comprises a plurality of alternating nitride and oxide films.

10 8. The transparent substrate of claim 7 wherein the transparent dielectric nitride film directly over the first high absorption blocker layer is followed by the following sequence of intermediate films, moving outwardly: a first intermediate transparent dielectric oxide film, a second intermediate transparent dielectric nitride film, and a second intermediate transparent dielectric oxide film.

15 9. The transparent substrate of claim 8 wherein the second infrared-reflective film is deposited directly over said second intermediate transparent dielectric oxide film.

10. The transparent substrate of claim 1 wherein the transparent dielectric nitride film directly over the second high absorption blocker layer comprises silicon nitride.

11. The transparent substrate of claim 10 wherein the silicon nitride has a thickness of less than about 100Å.

12. The transparent substrate of claim 1 wherein the transparent dielectric nitride film directly over the second high absorption blocker layer is followed by the following sequence of outer films, moving outwardly: a titanium nitride layer, and an outermost

silicon nitride layer.

13. The transparent substrate of claim 12 wherein the titanium nitride layer has a thickness of less than about 30Å.

14. The transparent substrate of claim 1 wherein the coating comprises an inner coat 5 between the substrate and the first infrared-reflective film, the inner coat comprising at least one transparent dielectric film having an index of refraction of between about 1.7 and about 2.4.

15. The transparent substrate of claim 14 wherein the coating further includes a transparent base layer between the substrate and the inner coat, the transparent base 10 layer comprising silicon dioxide deposited directly upon the substrate.

16. The transparent substrate of claim 1 wherein the coating has an emissivity of less than about 0.08.

17. An insulating glass unit comprising first and second panes held in a spaced-apart configuration, the panes having confronting inner surfaces oriented toward a between-15 pane space and opposed outer surfaces oriented away from the between-pane space, one of said inner surfaces bearing a tempered high shading performance low-emissivity coating comprising first and second infrared-reflective films and first and second high absorption blocker layers positioned respectively directly over the first and second infrared-reflective films, the first and second high absorption blocker layers comprising 20 niobium, said coating including a middle coat comprising a transparent dielectric nitride film deposited directly over the first high absorption blocker layer and including an outer coat comprising a transparent dielectric nitride film deposited directly over the second

high absorption blocker layer, the insulating glass unit having a total visible transmittance of less than about 0.45.

18. The insulating glass unit of claim 17 wherein the total visible transmittance is between about 0.35 and about 0.43.

5 19. The insulating glass unit of claim 17 wherein the coating has an emissivity of less than about 0.08.

20. The insulating glass unit of claim 17 wherein the insulating glass unit has an exterior visible reflectance of less than about 15%.

10 21. The insulating glass unit of claim 20 wherein the exterior visible reflectance is less than about 13%.

22. The insulating glass unit of claim 17 wherein the insulating glass unit has an exterior reflected color characterized by an  $a_h$  color coordinate of between about -0.75 and about -3.25 and a  $b_h$  color coordinate of between about -2.25 and about -4.75.

23. The insulating glass unit of claim 17 wherein the first and second infrared-15 reflective films have a combined thickness of between about 150 $\text{\AA}$  and about 260 $\text{\AA}$ , and wherein the first and second high absorption blocker layers have a combined thickness of greater than 50 $\text{\AA}$  but less than about 80 $\text{\AA}$ .

24. The insulating glass unit of claim 23 wherein the coating comprises, in sequence outwardly:

- (a) a silicon dioxide base layer;
- (b) an inner coat comprising at least one transparent dielectric film;
- 5 (c) the first infrared-reflective film;
- (d) the first high absorption blocker layer;
- (e) the middle coat;
- (f) the second infrared-reflective film;
- (g) the second high absorption blocker layer; and
- 10 (h) the outer coat.

25. The insulating glass unit of claim 24 wherein the inner coat has an optical thickness of between about 150Å and about 450Å, the middle coat has an optical thickness of between about 1200Å and about 1800Å, and the outer coat has an optical thickness of between about 445Å and about 605Å.

15 26. An insulating glass unit comprising first and second panes held in a spaced-apart configuration, the panes having confronting inner surfaces oriented toward a between-pane space and opposed outer surfaces oriented away from the between-pane space, one of said inner surfaces bearing a tempered high shading performance low-emissivity coating comprising first and second infrared-reflective films and first and second high absorption blocker layers positioned respectively directly over the first and second infrared-reflective films, the first and second high absorption blocker layers comprising niobium, said coating including a middle coat comprising a transparent dielectric nitride film deposited directly over the first high absorption blocker layer and including an outer

coat comprising a transparent dielectric nitride film deposited directly over the second high absorption blocker layer, the insulating glass unit having a solar heat gain coefficient of less than about 0.4.

27. The insulating glass unit of claim 26 wherein the solar heat gain coefficient is less

5 than about 0.3.

28. The insulating glass unit of claim 26 wherein the coating has an emissivity of less than about 0.08.

29. The insulating glass unit of claim 26 wherein the insulating glass unit has an exterior visible reflectance of less than about 15%.

10 30. The insulating glass unit of claim 29 wherein the exterior visible reflectance is less than about 13%.

31. The insulating glass unit of claim 26 wherein the insulating glass unit has an exterior reflected color characterized by an  $a_h$  color coordinate of between about -0.75 and about -3.25 and a  $b_h$  color coordinate of between about -2.25 and about -4.75.

15 32. The insulating glass unit of claim 26 wherein the first and second infrared-reflective films have a combined thickness of between about 150Å and about 260Å, and wherein the first and second high absorption blocker layers have a combined thickness of greater than 50Å but less than about 80Å.

33. The insulating glass unit of claim 32 wherein the coating comprises, in sequence outwardly:

- (a) a silicon dioxide base layer;
- (b) an inner coat comprising at least one transparent dielectric film;
- 5 (c) the first infrared-reflective film;
- (d) the first high absorption blocker layer;
- (e) the middle coat;
- (f) the second infrared-reflective film;
- (g) the second high absorption blocker layer; and
- 10 (h) the outer coat.

34. The insulating glass unit of claim 33 wherein the inner coat has an optical thickness of between about 150Å and about 450Å, the middle coat has an optical thickness of between about 1200Å and about 1800Å, and the outer coat has an optical thickness of between about 445Å and about 605Å.

35. A method of producing coated substrates, the method comprising providing a pane having generally-opposed major surfaces and depositing upon one of said major surfaces a temperable high shading performance low-emissivity coating comprising, in sequence outwardly:

- 5 (a) a first infrared-reflective film;
- (b) a first high absorption blocker layer deposited directly over the first infrared-reflective film, the first high absorption blocker layer comprising niobium;
- (c) a middle coat comprising a transparent dielectric nitride film deposited directly over the first high absorption blocker layer;
- 10      (d) a second infrared-reflective film;
- (e) a second high absorption blocker layer deposited directly over the second infrared-reflective film, the second high absorption blocker layer comprising niobium; and
- 15      (f) an outer coat comprising a transparent dielectric nitride film deposited directly over the second high absorption blocker layer;

wherein the first and second high absorption blocker layers are deposited at a combined thickness of greater than 50 angstroms.

36. The method of claim 35 wherein the first and second high absorption

20 blocker layers are deposited at a combined thickness of less than about 80Å.

37. The method of claim 36 wherein the first and second infrared-reflective films are deposited at a combined thickness of between about 150Å and about 260Å.

38. The method of claim 35 wherein the transparent dielectric nitride film

directly over the first high absorption blocker layer is deposited as a film comprising silicon nitride.

39. The method of claim 38 wherein the silicon nitride is deposited at a thickness of less than about 300Å.

5 40. The method of claim 35 wherein the deposition of the middle coat begins with depositing the transparent dielectric nitride film directly over the first high absorption blocker layer and ends with depositing a transparent dielectric oxide film directly beneath the second infrared-reflective layer.

10 41. The method of claim 40 wherein the deposition of the middle coat comprises depositing a plurality of alternating nitride and oxide films.

42. The method of claim 41 wherein, following deposition of the transparent dielectric nitride film directly over the first high absorption blocker layer, the method comprises depositing the following sequence of intermediate films, moving outwardly: a first intermediate transparent dielectric oxide film, a second intermediate transparent dielectric nitride film, and a second intermediate transparent dielectric oxide film.

15 43. The method of claim 42 wherein the second infrared-reflective film is deposited directly over said second intermediate transparent dielectric oxide film.

44. The method of claim 35 wherein the transparent dielectric nitride film directly over the second high absorption blocker layer is deposited as a film comprising silicon 20 nitride.

45. The method of claim 44 wherein the silicon nitride is deposited at a thickness of less than about 100Å.

46. The method of claim 35 wherein, following deposition of the transparent dielectric

nitride film directly over the second high absorption blocker layer, the method comprises depositing the following sequence of outer films, moving outwardly: a titanium nitride layer, and an outermost silicon nitride layer.

47. The method of claim 46 wherein the titanium nitride layer is deposited at a

5 thickness of less than about 30Å.

48. The method of claim 35 wherein the method comprises depositing an inner coat between the substrate and the first infrared-reflective film, the inner coat comprising at least one transparent dielectric film having an index of refraction of between about 1.7 and about 2.4.

10 49. The method of claim 48 wherein the method further comprises depositing a

transparent base layer between the substrate and the inner coat, the transparent base layer comprising silicon dioxide deposited directly upon the substrate.

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